

Persistent Primitive Trigeminal Artery Associated With Anterior Communicating Artery Aneurysm and Hypoplastic Vertebral Artery

Abstract

The persistent trigeminal artery is one of the presegmental arteries in the embryonic period; in some rare cases, it is associated with cerebral aneurysm but as a cause of subarachnoid hemorrhage (SAH) has not been described in the literature. We report a patient who presented a Fisher IV SAH associated with a ruptured intracranial aneurysm. The performed cerebral angiography demonstrated the presence of aneurysm in the anterior communicating artery associated to hypoplastic vertebral artery on the same side. We considered those finding coincidental. The coexistence of saccular aneurysm with anatomical variations in the intracranial vasculature is briefly discussed. It was managed by endovascular embolization. The patient returned to normal activities.

Keywords: Aneurysm, hypoplastic vertebral artery, subarachnoid hemorrhage, trigeminal artery

Introduction

The persistent trigeminal artery (PTA) belongs to a certain number of channels that set embryological anastomotic connections between the carotid and vertebrobasilar systems. Vascular cerebral anomalies, such as aneurysms, arteriovenous malformations, and neoplasms have been associated to PTA. More frequently is associated with various diseases, such as aneurysms of the circle of Willis. It is important to know the characteristics of this type of angiography anatomical variations and their clinical implications.^[1-5] We report the case of a patient who developed a subarachnoid hemorrhage (SAH), and the study of it determined the association of PTA and aneurysms of the anterior communicating artery associated with the hypoplastic vertebral artery.

Case Report

Right-handed 33-year-old female, physician, without any previous relevant medical history presented with clinical picture of the 8 days of evolution consisting in yell emit followed by the loss of consciousness while performing household tasks; posteriorly, she develops somnolence.

On her arrival, neuroradiological workup (brain computed tomography [CT] and

magnetic resonance imaging) disclosed a Fisher IV SAH [Figure 1]. Angiography was proceeded, determining the presence of aneurysm in the anterior communicating artery plus right PTA [Figure 2a]. Also was angiographically determined the acigos system of the anterior cerebral artery, because both were dependent of the right carotid circulation. Transient ventriculostomy was placed and translated to the Intensive Care Unit. Twenty-four hours later, it was decided to carry her to the operating room to place a stent in the basilar artery and to occlude the PTA associated to the basilar artery. A week later to the embolization, the patient developed hydrocephalus thus means adult pressure ventriculoperitoneal shunt was placed, and the patient was discharged another 15 days later. The patient returned to her normal life activities.

A cerebral arteriography was performed, showing the presence of an aneurysm in the anterior communicating artery with a diameter >5.11 mm, associated to PTA, also was determined the presence of the right posterior cerebral artery with embryonic characteristics. The acigos system of the anterior cerebral artery was dependent of the right carotid axis. The right vertebral artery was hypoplastic with atherosclerosis signs in the antero- and postero-inferior cerebellar arteries (AICA).

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In our institution was decided to perform the endovascular management of the anterior communicating artery aneurysm. The patient was closely controlled by our staff.

At the 1st day of hospital stance, the patient was driven to endovascular occlusion performed under general anesthesia. The angiography was performed with a 5F catheter. Using the transfemoral venous approach, a No. 6 French envoy guiding catheter was placed into the left internal jugular vein after femoral puncture, and the aneurysm was catheterized through the stent mesh with a Tracker Excel 14 microcatheter. Total angiographically confirmed the occlusion of the aneurysm was attained with stents neuroform.

A follow-up angiogram demonstrated complete occlusion of the aneurysm [Figure 2b and c]. The patient was discharged on a program of clopidogrel (75 mg/another angiography revealed the preservation of the PTA and the complete occlusion of the fistula day) and aspirin (325 mg/day). At her 6-month follow-up visit, she was symptom-free, and the control angio CT three-dimensional obtained at that time demonstrated the occlusion of the basilar aneurysm as well as patency of the basilar artery [Figure 3].

Discussion

The carotid-vertebrobasilar anastomosis, known as presegmental arteries in the embryonic period, is blood supply from the internal carotid artery to the vertebrobasilar primitive systems.^[6-8] Approximately, at the 5th week of gestation, four pairs of presegmental arteries, which are named according to the surrounding structures that originate, trigeminal, otic, and proatlantal intersegmental hypoglossal. The PTA usually originates in the vertical and horizontal segments of the proximal intracavernous internal carotid artery. Cloft *et al.* reported that aneurysms are associated with PTA are present in 2–3% of cases, which suggests that aneurysms associated with vascular abnormalities can be embryonic chance rather than causal.^[9] The PTA has also been linked to diseases such as hemifacial spasms, cranial nerve paresis, trigeminal neuralgia, and to vascular alterations such as aneurysms, Moyamoya disease and anatomical alterations of the internal carotid artery.^[10-12]

The PTA navigates through the cavernous sinus, posteromedial to the ophthalmic branch of the trigeminal nerve, or lateral to the dorsum sellae, crossing it, and binds to the basilar trunk between the superior cerebellar and AICA. The occurrence of PTA is demonstrated by vertebrobasilar angiographic methods in 0.06–0.6% of the cases.^[13-18]

During a ruptured intracranial aneurysm associated with a PTA, symptoms may occur in the context of typical acute SAH or also by compressive symptoms derived from irritation of the III, IV, V and VI cranial nerves by compression of the outer wall of the cavernous sinus. The cases reported in the medical literature describing the association of PTA with

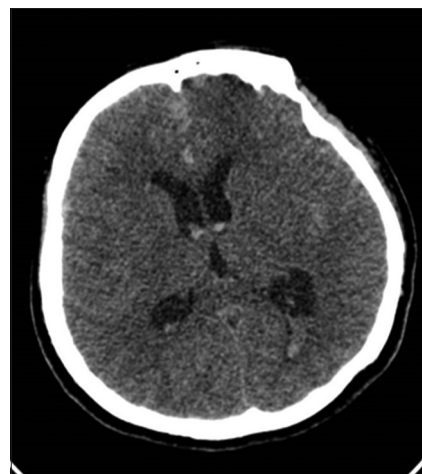


Figure 1: Computed tomography scan with subarachnoid hemorrhage

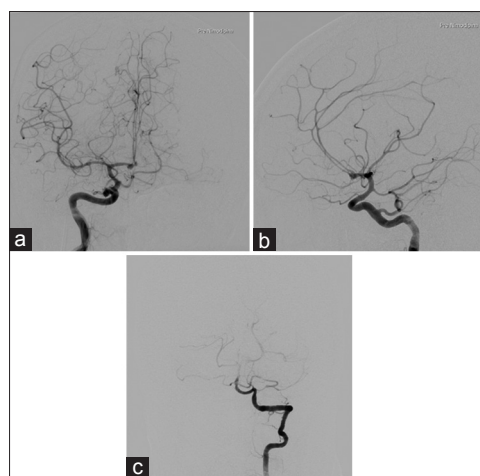


Figure 2: (a) Angiography showing the presence of aneurysm in the anterior communicating artery plus right persistent trigeminal artery, (b and c) angiogram demonstrated complete occlusion of the aneurysm

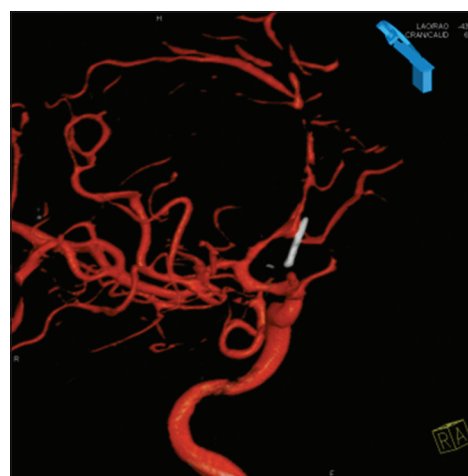


Figure 3: Control angio computed tomography three-dimensional obtained at that time demonstrated occlusion of abasilar aneurysm as well as patency of the basilar artery

other intracranial vascular anomalies (e.g., vertebral artery hypoplasia plus aneurysms) are rare.^[19]

Conclusion

We presented an extremely rare case of SAH associated with anterior communicating artery aneurysm plus hypoplastic vertebral artery. The endovascular management of basilar aneurysms associated with PTA can be managed successfully by endovascular methods.

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Conflicts of interest

There are no conflicts of interest.

References

1. Padget D. The development of the cranial arteries in the human embryo. *Contrib Embryol* 1948;32:205-62.
2. Fields WS. The significance of persistent trigeminal artery. Carotid-Basilar anastomosis. *Radiology* 1968;91:1095-101.
3. Yilmaz E, Ilgit E, Taner D. Primitive persistent carotid-basilar and carotid-vertebral anastomoses: A report of seven cases and a review of the literature. *Clin Anat* 1995;8:36-43.
4. Wolpert SM. The trigeminal artery and associated aneurysms. *Neurology* 1966;16:610-4.
5. Ali S, Radaideh MM, Shaibani A, Russell EJ, Walker MT. Persistent trigeminal artery terminating in the posterior inferior cerebellar artery: Case report. *Neurosurgery* 2008;62:E746-8.
6. Takase T, Tanabe H, Kondo A, Nonoguchi N, Tane K. Surgically treated aneurysm of the trunk of the persistent primitive trigeminal artery – Case report. *Neurol Med Chir (Tokyo)* 2004;44:420-3.
7. Eluvathingal Mutikkal TJ, Varghese SP, Chavan VN. Persistent trigeminal artery and associated vascular variations. *Australas Radiol* 2007;51:B31-3.
8. Jackson IJ, Garza-Mercado R. Persistent carotidbasilar artery anastomosis: Occasionally a possible cause of tic douloureux. *Angiology* 1960;11:103-7.
9. Cloft HJ, Razack N, Kallmes DF. Prevalence of cerebral aneurysms in patients with persistent primitive trigeminal artery. *J Neurosurg* 1999;90:865-7.
10. Chambers AA, Lukin R. Trigeminal artery connection to the posterior inferior cerebellar arteries. *Neuroradiology* 1975;9:121-3.
11. Enomoto T, Sato A, Maki Y. Carotid-cavernous sinus fistula caused by rupture of a primitive trigeminal artery aneurysm. Case report. *J Neurosurg* 1977;46:373-6.
12. Guglielmi G, Viñuela F, Dion J, Duckwiler G, Cantore G, Delfini R. Persistent primitive trigeminal artery-cavernous sinus fistulas: Report of two cases. *Neurosurgery* 1990;27:805-8.
13. Kwak R, Kadoya S. Moyamoya disease associated with persistent primitive trigeminal artery. Report of two cases. *J Neurosurg* 1983;59:166-71.
14. Zhang CW, Xie XD, Yang ZG, Wang CH, You C, Mao BY, *et al.* Giant cavernous aneurysm associated with a persistent trigeminal artery and persistent otic artery. *Korean J Radiol* 2009;10:519-22.
15. Lee KS, Kelly DL Jr. Intraseptal persistent trigeminal artery associated with a pituitary adenoma. Case report. *J Neurosurg* 1989;70:271-3.
16. Ricolfi F, Decq P, Brugieres P, Blustajn J, Melon E, Gaston A. Ruptured fusiform aneurysm of the superior third of the basilar artery associated with the absence of the midbasilar artery. Case report. *J Neurosurg* 1996;85:961-5.
17. George AE, Lin JP, Morantz RA. Intracranial aneurysm on a persistent primitive trigeminal artery. Case report. *J Neurosurg* 1971;35:601-4.
18. Matsushita A, Yanaka K, Hyodo A, Nose T. Persistent primitive otic artery with IC-cavernous aneurysm. *J Clin Neurosci* 2003;10:113-5.
19. Turkoglu E, Arat A, Patel N, Kertmen H, Baskaya MK. Anterior communicating artery aneurysm associated with an infraoptic course of anterior cerebral artery and rare variant of the persistent trigeminal artery: A case report and literature review. *Clin Neurol Neurosurg* 2011;113:335-40.